



ALAMEDA COUNTY CONGESTION MANAGEMENT AGENCY

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TRI-VALLEY TRIANGLE STUDY TECHNICAL ADVISORY COMMITTEE

MEETING NOTICE

Tuesday, April 11, 2006

9:30-11:30 AM

Regional Meeting Room

Dublin City Offices

100 Civic Plaza, Dublin. CA 94568

AGENDA

1. Introductions

2. Minutes of March 13, 2006 Meeting*

Action

It is recommended that the TAC approve minutes of the March 13, 2006 meeting.

3. Follow-up to TAC Comments from March 13, 2006 Meeting - BaselineAM and

Discussion / Action

The Consultant team has investigated comments relating to the second bottleneck that would occur under Alternative 6AM but did not occur under the BaselineAM condition. The team found the issue to be with the Baseline forecast volumes and not with the alternatives, and results from saturated unstable conditions.

4. Results of Modeling

Discussion / Action

a. Alternative 4*

The consultants have completed the three step modeling process for Alternative 4. The three steps include running of the travel demand model to provide input into the CORSIM model and then feedback from the operations model to the travel demand model. The attached memo documents the results. The TAC is requested to review the results to identify any "anomalies" in the modeling.

b. Alternatives'^*

Analysis for Alternative 5 should be completed near the PAC meeting date. If results are available, they will be presented to the TAC at the meeting with the TAC providing comments via e-mail or at the following meeting.

5. Follow-up to PAC Meeting Items from March 24, 2006 PAC Meeting

a. Chart showing locations of bottlenecks and queues ** - summary chart schematic will be presented.

Action

b. Select locations for values on difference plots ** - the PAC requested volume change percentages be shown in a larger size font on the difference plots so that they can be read when printed at 8.5 x 11 size. TAC cities to provide a few select locations that will be added to the plots.

Action

<p>c. PAC would also like the following:</p> <ul style="list-style-type: none"> i. AM & PM difference plot of the base calibration model traffic (existing conditions) and the baseline 2030 volumes. ii. XX/regional/cut-through traffic summaries for each alternative by Jurisdiction. ill, Qualitative data presentation in table format to use the words "increase" and "decrease" instead of arrows or "+" and "-". iv. Show travel time savings as vehicle minutes saved instead of simply minutes per vehicle saved from Andrade to North Flynn. This would essentiall}' be VHT on state routes. V. Request from Dublin for data on MOEs at specific links for all alternatives (up to 3 links) 	<p>Action</p>
<p>6. Other Issues Relating to Alternative Configurations</p>	<p>Discussion/Action</p>
<p>7. Report Outline'^</p>	<p>Discussion/Action</p>
<p>8. Methodology' for Comparison of Benefits to Costs*</p>	<p>Discussion/Action</p>
<p>9. Schedule to Complete - Upcoming TAC and PAC Meeting Dates*'^</p>	<p>Action</p>
<p>10. Adjourn</p> <ul style="list-style-type: none"> • Materials attached ** Materials to be distributed at meeting <ul style="list-style-type: none"> ○ Tri-Valley Triangle Study - Benefit - Cost Issues ○ Tri-Valley Triangle Traffic Study Report Outline ○ Triangle Traffic Study Baseline ○ ACCMA Triangle Study Future Base 	

PARSONS

100 Park Center Plaza, Suite 450 • San Jose, California 95113
(408) 280-6600 • Fax (408) 280-7533

Date: March 13, 2006

645176/224.01

Project: Tri-Valley Triangle Study

Subject: Triangle Technical Advisory Committee Meeting Minutes

To: All who attended meeting, see attached sign-in sheet

From: Gui Shearin Parsons

Enclosed are the minutes for the Triangle TAC meeting held on March 13, 2006. If you have any questions, comments, or changes to the minutes, please contact Jean Hart. The next TAC meeting is scheduled for April 11, 2006 at 9:30 AM at the Dublin City Hall.



**PARSONS
RECORD OF MINUTES**

645176/224.01

PROJECT: Tri-Valley Triangle Study

SUBJECT: Triangle TAC Meeting

DATE: March 13, 2006; 1:00 PM

LOCATION: Dublin City Hall
100 Civic Plaza
Dublin, CA 94568

ATTENDEES: See attached sign-in sheet, Agenda, and attachments

MINUTES BY: Parsons

The meeting consisted of a presentation on the results of modeling Alternatives Future Base, 1, and 6; a review of qualitative measures; presentation of estimated capital costs; and developing an agenda for the next PAC meeting.

The following is a summary of the meeting. Action items are shown in **bold** and critical path items are in ***bold and italicized***. Action items subsequently completed are in *italics*.

DISCUSSION	ACTION
<u>Welcome and Introductions</u> : Kai Chan of Parsons opened the meeting and everyone introduced themselves to the group. Representatives of all three Tri-Valley cities, Caltrans, and Alameda County were present, although Bob Vinn of Livermore arrived after the minutes were approved.	
<u>Review and Approval of Minutes of January 12, January 20 and February 8, 2006</u> : The minutes of the three meetings were approved with the following changes: <ul style="list-style-type: none">• Obaid Khan of Alameda County had sent in an e-mail correction regarding the February 8 meeting minutes.• Ray Kuzbari of Dublin said that in the 1-20-06 TAC meeting, he was recommending review of existing truck data, not collection of additional data.	
<u>Results of Modeling for Alternatives 1 and 6</u> : Gui Shearin of Parsons presented the results of the revised modeling for Alternatives Future Base, 1, and 6. The information consisted of a revised memorandum on Summary of Model Results (dated 3-13-06), queuing graphics, and travel demand difference plots. The revised memorandum was passed out at the meeting; the differences compared with the memorandum in the advance packet were improvements in state route VMT calculations and average trip time options for TAC discussion. The conclusions of the memorandum remained unchanged. Questions and comments from the TAC on the queuing results and	<i>Parsons to review Alt 6 AM westbound</i>

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Triangle Traffic Study – TAC Meeting Minutes – March 13, 2006

difference plots included the following:

- Ray Kuzbari questioned the validity of the diversion to Dublin Boulevard from westbound I-580 in the Alternative 6 AM case. Gui Shearin said that the diversions were the result of the westbound bottleneck approaching Santa Rita. Ravi Puttagunta noted that the bottleneck and queuing was aggravated by the high number of trucks restricted to the right lanes and this limited the ability of drivers to get on and off of the freeway. Ray requested the consultant team to take a closer look at the results.
- Ray Kuzbari also questioned the diversion from Central Parkway in Alternatives 1 and 6 PM eastbound conditions, particularly the back and forth nature of the effect under Alternative 6. Gui Shearin said that he thought that this might be simply noise in the assignments given that the numbers shown on the difference plot were less than 50 vehicles. There was some discussion of whether a threshold of greater than 50 or 100 vph would eliminate this effect if it were simply noise in the model.
- Obaid Khan of Alameda County said that there were also puzzling diversions between I-580 and the Altamont Pass Road in the Alternative 1 AM condition and the Alternative 6 PM condition.
- David Seriani of Caltrans asked why there was no bottleneck at Isabel Avenue eastbound in the PM peak under Alternatives 1 and 6 when there was one under the Future Base. He also said that the westbound AM bottleneck approaching Santa Rita under Alternative 6 does not make sense because there were no geometric changes in the westbound direction compared with the Future Base. Ravi Puttagunta of Parsons said that these queuing differences were the result of relatively small changes in the travel demand and served volumes that had a disproportional effect because I-580 would be at capacity and operating at an unstable level of service in many locations as well as would have high truck percentages that restricted flow in the two right-hand lanes.
- Bob Vinn of Livermore asked about the meaning of both increases and decreases in the difference plot for Alternative 1 eastbound PM between El Charro and Airway. He would like the Cube file to better see which volume applies to which link.

Gui Shearin presented three ways of calculating average trip time in the measures of effectiveness and asked the TAC which approach was more desirable. The three methods were as follows:

- Overall average trip time (i.e., for all trips in model) from combined travel demand and CORSIM statistics; this was the statistic included in the MOE table of the memorandum.
- Overall average trip time (i.e., for all trips in model) from the travel demand model only; and
- Selected point-to-point average trip times corresponding to origin/destination (o/d) pairs. The two o/d paths illustrated in the meeting were the peak-direction travel times between Andrade and North Flynn for the freeway route only and for the freeway plus Route

diversion to Dublin Boulevard and the Alt. 1 and 6 PM diversions from Central Parkway.

Parsons to review the Altamont Pass diversions under Alt 1 AM and Alt 6 PM.

Parsons to review the lack of a PM bottleneck eastbound at Isabel under Alts 1 and 6 as well as the new AM bottleneck on westbound I-580 approaching Santa Rita under Alternative 6.

Parsons to provide Cube file plot and explanation for Alt 6 eastbound PM.

Parsons to use o/d method for computing average trip time MOE and to include segments best representing times to city downtowns.

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Triangle Traffic Study – TAC Meeting Minutes – March 13, 2006

<p>84 route.</p> <p>In discussion of these approaches, the TAC preferred showing the times for the o/d pairs. Bob Vinn of Livermore asked if some segments could also be shown that would give times to the city downtowns. Because CORSIM does not model the local streets, the segments might be limited to the times to closest freeway interchange or Route 84 intersection to a given downtown. Gui Shearin said that the times for multiple o/d pairs would have to be averaged in some way to allow them to be scored as a single time saving measure per alternative. <i>(Note: At the March 24, 2006 PAC Meeting, the PAC changed this direction to show state route travel time savings multiplied by the number of vehicles, which is simply VHT on the state routes from CORSIM.)</i></p>	
<p><u>Qualitative Measures:</u> Kai Chan of Parsons presented an update of the qualitative measures memorandum based on TAC comments received to date. The TAC requested that the methodology be changed to include queuing location questions that focused on the presence of queues in the jurisdictions of the cities of Dublin, Pleasanton, and Livermore, and within Alameda County. There was some discussion of whether rating the queues by their proximity to cities was better than rating them overall, with mixed opinions offered. Rob Wilson of Pleasanton said that the overall perspective was better, with the key question being whether the queues were away from critical areas or not. The compromise method of one question for the overall count of queues and four questions aimed at the effects on the individual jurisdictions appeared to be acceptable to the group. Ray Kuzbari asked what would happen if a queue overlapped two cities. Kai Chan said that we would split the effect, which was acceptable to Ray Kuzbari and Rob Wilson. Obaid Kahn asked how we would handle a bottleneck that moves from jurisdiction to another? Would it be better to look at the length of the queue, or look at the number of bottlenecks? David Seriani said that we would need to look at the “intensity” of the queue. Speed of the queue was important to consider in the rating, and that stop-and-go would be the worst in comparison to a queue that kept moving, albeit more slowly than free-flow speeds. Ravi Puttagunta said that was being taken into account.</p> <p>Bob Vinn asked if the AM Alternative 6 westbound queue is worse than the Future Base westbound queue. Gui Shearin said that VHD and relevant trip time were about 1% worse for Alternative 6, but Ravi Puttagunta said that the Future Base queue extended east of the simulation area, so we do not know how long the Future Base queue would really be and no precise comparison could be made.</p> <p>For the project readiness qualitative criterion, there was a suggestion that the project sponsor for each project help to assemble data to be presented to the TAC and each city would get to vote on the rating of the information. Bob Vinn asked what the goal of the project readiness criterion was, i.e., that the schedule would make sense for each project should be taken into account. For the qualitative rating of funding, Bob Vinn suggested that it should account for what funding is committed to a project plus what could be allocated by moving funding around in the total funding pot. Jean Hart of the CMA said that process was important here, that RTP updates would be needed to clarify what funding was agreed upon for each project.</p> <p>Rob Wilson said that the consultant should do the sample scoring and details</p>	<p>Parsons to develop draft “project readiness” considerations and send to the TAC members by e-mail for comment.</p>

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Triangle Traffic Study – TAC Meeting Minutes – March 13, 2006

and let the TAC vote on it. It was agreed that the high and low ratings would be discarded. It was suggested that relevant points, such as the presence of obstacles to the project (included in the readiness criterion), should be left open for the PAC to give input as part of their review and acceptance of the overall scoring results.	
<u>Agenda for March 24th Policy Advisory Committee Meeting</u> : There was discussion of what to present at the upcoming PAC meeting. Generally the PAC would need a status report since the last PAC meeting was November 4. Rob Wilson suggested reminding them of the project and its purpose, what the alternatives are, and where we are in the process. Because the scoring methods have previously been presented to the PAC, a presentation of the overall methods with example data to be used could be given to make sure the PAC understands what they will be reviewing at a later meeting. The schedule should also be explained. The red/green difference plots might also be included if they could be restricted to showing only the most important diversions. The presentation needs to convey that work has been going on and explain the reasons why the work has taken longer than anticipated.	<i>Parsons to provide the CMA with an agenda.</i>
<u>Estimated Costs of Alternatives</u> : Kai Chan gave a brief overview of the estimated costs and asked for any feedback from the TAC via e-mail. The TAC iterated that the cost estimates should be by component and Kai noted that was how they had been prepared.	
<u>Next Steps/Next Meeting</u> – The next TAC meeting was planned for April 11, 2:30 p.m. Location: Dublin City Hall. This was subsequently changed to 9:30 a.m. The meeting will review the results of the on going travel demand modeling and simulation.	



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TRI-VALLEY TRIANGLE STUDY TECHNICAL ADVISORY COMMITTEE ROSTER OF ATTENDANCE

MARCH 13, 2006

REGIONAL MEETING ROOM, DUBLIN CITY OFFICES
100 CIVIC PLAZA, DUBLIN, CALIFORNIA

NAME	JURISDICTION/ ORGANIZATION	PHONE #	E-MAIL
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13. Bob Vinn	Livermore	925 960 4516	bgvinn@ci.livermore.ca.us
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Memorandum

TO: Tri-Valley Triangle Study Technical Advisory Committee

FROM: Parsons

DATE: April 4, 2006

SUBJECT: **Tri-Valley Triangle Study – Summary of Future Baseline, and Alternatives 1, and 6
Response to TAC Comments Comparing Alternatives 1 and 6 with the Future
Baseline Alternative**

In preparing to go to the March 13 TAC meeting, the consultant team had noticed that the Alternative 6 operations did not match the future baseline in the AM peak period (FB_{AM}) as closely as would be expected. The team examined and discussed the effect extensively and decided that the difference in operations was valid because the demand volumes were within the tolerance of the model, the earlier operations analysis using four percent trucks found operations comparable between the FB_{AM} and Alternative 6, and the operations analysis showed I-580 operating at unstable conditions which was attributed to the increased percentage of trucks resulting in a right lane overload condition that made entering and exiting I-580 difficult.

At the March 13 TAC meeting, the TAC raised similar question relating to the results of Alternative 6. The consultant team was not able to provide an explanation for the situation that was heard by the TAC. In responding to the TAC's direction to provide a better explanation, the consultant team went back and looked at the travel demand runs. The team noticed that in the AM peak period there was a small difference in demand volumes being used in the CORSIM analysis between the future baseline and Alternative 6 that wasn't there with other alternatives. Further investigation found that (1) the FB_{AM} CORSIM demand volumes came from a different set of travel demand model runs than the other alternatives, (2) that the demand volumes were consistent in the PM peak period runs for the future base case and alternatives, and (3) the demand volumes used to develop the travel demand Measures of Effectiveness (MOE) are consistent for the future baseline condition and alternatives for both the AM and PM peak hours.

The FB_{AM} showed a demand volume of 180 vehicles less than the model runs of the alternatives. The 180 vph difference in the forecast travel demand out of more than 9000 vph represents less than two percent of the demand volume; well within recognized and accepted tolerances of a travel demand model. These demand model volumes were produced in early December and were vetted by the consultant team and the TAC.

Both the consultant team and the TAC did not expect such small differences in volumes to be responsible for the differences seen between the FB_{AM} and Alternative 6 as demonstrated by the comments received at the March 13 TAC meeting where the small differences in volumes were dismissed as a possible cause of the bottleneck and queuing between Santa Rita and El Charro roads.

What has become apparent in the investigation is that because I-580 is operating under unstable conditions, very small differences can make a big difference in operations. Using the smaller demand volumes of the FB_{AM} resulted in stable mainline operations above capacity when the model was run

using four percent trucks, however, when the same volumes were run and the percentage of trucks increased from four to eight percent, unstable mainline operations resulted.

Under the unstable conditions of the FB_{AM} and Alternative 6, the operations analysis shows that east of the Isabel Avenue interchange the volumes approach capacity and traffic platoons, but a bottleneck and queue do not form. It could be reasonably expected that day-to-day variations in traffic would have more of an effect than this difference in demand volumes.

Given the unstable operations, the model may need a higher level of refinement and detail than had been originally envisioned or thought necessary when agreement was reached on the model validation process in order to provide results that match expectations. The consultant team re-ran the model for FB_{AM} with the revised demand volume and reviewed the results in order to obtain more consistent operational analysis results that the Tri-Valley partner cities could stand behind. Increasing the demand volume of the FB_{AM} by 180 vph to make the volumes more consistent with the alternatives were found to have the following effects:

1. Increases in diversionary traffic along Dublin Boulevard in the alternatives, as compared to the baseline condition, which would be reduced or eliminated. (Diversionary traffic would also occur in the FB_{AM} which had not been seen before.)
2. FB_{AM} operations on I-580 that would be at lower levels.
3. Mainline operations on I-580 would be comparable under the FB_{AM} and Alternative 6.
4. Both Alternatives 1 and 6 would perform better than the baseline condition; however, Alternative 6 would perform better than Alternative 1.

These results are summarized in greater detail in the memorandum "Tri-Valley Triangle Study – Summary of Alternatives Future Base, 1, and 6" dated April 4, 2006 (Revision of 3-13-06 version to address TAC questions and new data).

Memorandum

TO: Tri-Valley Triangle Study Technical Advisory Committee

FROM: Parsons

DATE: April 4, 2006 (Revision of 3-13-06 version to address TAC questions and new data)

SUBJECT: Tri-Valley Triangle Study – Summary of Alternatives Future Base, 1, 4, and 6

Below, please find the Summary of CORSIM Analysis of Alternatives Compared with the Future Base Alternative. Note that information for all Alternatives completed to date is included for your convenience. The consultants recommend that this memo be updated after the analysis has been completed for each Alternative. At the end of this process all alternative analyses will be included in one memo.

Alternative 1

- Alternative 1 improves operations in the AM westbound direction east of Isabel. This is a shifting of the I-580 bottleneck toward Santa Rita instead of its location at Isabel Avenue in the Future Base.
- The eastbound PM secondary bottleneck on I-580 at Isabel is absent compared with the Future Base because the mainline mixed-flow volumes are about 300 vph less.
- There is no operational problem in the eastbound AM direction on I-580.
- On I-680, there are no operational problems northbound; the northbound off-ramp volumes onto Route 84 are higher than in the Future Base. In the southbound direction, the mainline queue extends from Route 84 to Sunol because of the merge and high ramp metering rate (1,800 vph).

Alternative 4

- Alternative 4 has similar operations to the Future Base for all conditions except for the eastbound PM condition on I-580.
- For eastbound I-580 in the PM peak, Alternative 4 has improved operations east of Vasco Road compared with the Future Base, with no slow down eastbound on the Altamont Pass.
- There are similar AM slowdowns between El Charro and Santa Rita westbound under both the Future Base Alternative and Alternative 4. See the first bullet under Alternative 6 for additional information.

Alternative 6

- Alternative 6 has similar operations to the Future Base in the AM westbound and eastbound directions on I-580. Refinement of the AM travel demand for the Future Base Alternative resulted in similar slowdowns between El Charro and Santa Rita westbound under both the Future Base Alternative and Alternative 6. See FB-AM 032106.doc for more details. This congestion is the result of slightly higher westbound traffic volumes (less than 2% or 200 vph) than previously

simulated for the Future Base Alternative combined with near capacity and unstable westbound AM conditions with high percentages of trucks under all of the alternatives.

- In the PM, I-580 is able to serve more HOV and mixed flow volumes, but congestion is higher between I-680 and Santa Rita because of the weaving and higher volumes. The eastbound PM secondary bottleneck at Isabel is absent compared with the Future Base because of additional capacity.
- On I-680 northbound in the PM, more HOV volumes are being served because of the extended HOV lane. The off-ramp volumes to Route 84 are similar to the Future Base because of the single lane off-ramp.
- There is no substantial difference in I-680 AM conditions compared with the Future Base.

Additional Information

- See the queuing files included in the 4-4-06 TAC packet for summary detail on lane geometry, traffic queuing, speed, and volumes. There is no queuing diagram for northbound I-680 because there are no operational problems.
- Also see the files for PM difference plots included in the 4-4-06 TAC packet for Alternatives 1 and 6 compared with the Future Base Alternative. These are from the travel demand model after CORSIM results are included. The AM difference plots have been revised per a preliminary estimate of the westbound I-580 AM operations and new files are included with this memorandum. There are several features of the plots that require explanation and that were the subject of questions in the 3-13-06 TAC meeting. These are addressed by the following bullets:
 - The plots already suppress any bandwidths for differences of less than 100 vehicles per hour. This occasionally leads to diversions that appear discontinuous, but the differences shown are not "noise" but valid shifts in demand. The numbers for all differences, however, are printed by direction next to each arterial and freeway, so the diversions can be tracked more closely if the plots are blown up to allow the numbers to be read.
 - On the freeways, the differences for the HOV lanes are plotted on the outside of the freeway because there is no room to show them in the middle. The HOV differences can appear to be for a parallel frontage road if the plots are not read carefully. There was a question about this for the Alternative 1 PM peak between El Charro and Airway eastbound, where there is no parallel through frontage road. The Cube plot files are attached for those who would like a closer look.
 - In Alternative 1 AM eastbound conditions on I-580, there are diversions to Dublin Boulevard compared with the Future Base because of the queue moving west under Alternative 1. There is a slowdown or secondary bottleneck between El Charro and Santa Rita under both the Future Base Alternative and Alternatives 4 and 6, as explained under Alternative 6 in the first section of this memo. With this slowdown appearing in both cases, the AM Alternative 6 difference plot (as well as the new Alternative 4 AM plot) now has no diversion to Dublin Boulevard compared with the Future Base. Also the westbound diversions to Dublin Boulevard under Alternative 1 are somewhat less than previously shown as a result of a more congested Future Base.
 - Under both Alternative 1 and 6 difference plots for the PM peak hour, there are diversions shown from Central Parkway with the added Route 84 or I-580 freeway eastbound capacity. While it would appear that diversion should come only from Dublin Boulevard because it is the primary parallel arterial to I-580, the plots show valid trends. This is because the demand for Dublin Boulevard is over capacity to the point that while there would be traffic shifting from Dublin Boulevard to the freeway with the

added capacity eastbound, there is no net relief because of the overflow to Central Parkway that returns to Dublin Boulevard.

- On the difference plots for the Alternative 1 AM and both the Alternative 4 and 6 PM peak hours, there are differences shown on Altamont Pass Road and Carroll Road that are parallel to I-580 between North Flynn Road and Greenville Road. Carroll Road is the right side of the inverted “Y” formed just north of I-580 between North Flynn and Greenville Roads, while Altamont Pass Road forms the stem and left side of the “Y.”
 - In the Alternative 1 AM case, there is a decrease in westbound traffic bypassing the freeway from North Flynn Road to Greenville Road via Carroll Road and Altamont Pass Road due to less congestion on I-580 westbound with the queuing moving west of Isabel. At the same time, there is an increase in traffic from Altamont Pass Road accessing I-580 at North Flynn Road via eastbound Carroll Road because of better conditions on westbound I-580.
 - In the Alternative 4 and 6 PM cases, there is a decrease in eastbound traffic on the left leg of Altamont Pass Road. This traffic appears as an increase on eastbound I-580 and westbound Carroll Road. In all of these cases, there is more traffic using I-580 instead of diverting to Altamont Pass Road to/from Greenville Road as a reliever route.

Summary of Measures of Effectiveness –Table 1 and Table 2

VMT Summary

- Dublin shows increased VMT in the AM under Alternative 1 because of the traffic diverting from the westbound freeway to Dublin Boulevard. This is a result of the westbound bottleneck shifting westward from Isabel toward Santa Rita under Alternative 1. Trucks are a major factor in causing this westbound AM bottleneck. Over half of the AM VTM increase is due to additional regional traffic on Dublin streets (Table 2). Over both peak hours, there is a small net decrease in VMT for Dublin under Alternative 1 while Alternative 4 shows an even smaller VMT decrease and Alternative 6 shows a slightly larger VMT decrease.
- Alameda County has slightly negative VMT (good) with Alternative 1, and a slightly larger decrease with Alternative 6, and a slight increase with Alternative 4. The Alternative 4 increase is the result of increased regional traffic on County roads (Table 2). Alternative 4 has slightly positive VMT effects, i.e., reductions, on the other local jurisdictions.
- Livermore benefits most from Alternative 6 with a 5.2% reduction in VMT; Livermore and Pleasanton would have 2.4% and 3.2% reductions, respectively, in VMT from Alternative 1.
- Overall, the local jurisdictions have a 2% to 3% decrease in VMT from Alternatives 1 and 6, but it is very unevenly distributed as noted above. Alternative 4 would reduce VMT for local jurisdictions by about 0.3%.
- State route VMT is down by 2% to 5% for Alternatives 1 and 6 respectively, leading to about a 2% overall decrease in VMT. This decrease is the consequence of less diversion and less out of direction travel under Alternatives 1 and 6 compared the Future Base Alternative. State route VMT goes up in the PM under Alternative 6 as a result of higher eastbound capacity compared with the Future Base, leading to an average 1% increase in state route Alternative 6 VMT overall, and about a 1% decrease in total VMT.
- XX mileage (cut through VMT) is down about 7% to 11% with Alternatives 1 and 6—more with Alternative 6 than Alternative 1 by virtue of high reduction in VMT through Livermore. Alternative 4 would reduce XX mileage less than 2%. See Table 2 for a distribution of XX mileage by jurisdiction.

Other MOE Summary

- Generally Alternative 6 achieves better results for the other measures of effectiveness than does Alternative 1, except for average travel time where Alternative 1 achieves a 15% reduction in travel time compared with 6.5% achieved by Alternative 6. Both Alternatives 1 and 6 achieve better overall results than Alternative 4, although Alternative 4 has less increase in queuing than Alternative 1. The measures are VHD, PHT, average travel time, average speed, and length of queues.
- Only Alternative 6 achieves a reduction in queue lengths. Alternatives 1 and 4 have increases, largely because of the increased AM queuing.
- As per the TAC recommendation on 3-13-06, average travel time is computed in CORSIM for the average of peak direction trips between Andrade Road and North Flynn Road for both the freeway-only route and the freeway-plus-Route-84 route. Trip times via this method appear to be more meaningful and may be closer to the original intent of the TAC. The PAC has requested that this statistic be displayed as time x vehicles to give a larger number, i.e., total hours saved along these routes. Future editions of this table will display the statistic in that fashion.

Table 1. Summary of Alts 1, 4 & 6 (difference between future base and alternatives)

Alternative	Peak hour period	Vehicle Miles of Travel (VMT) by Jurisdiction								Vehicle Hours Delay (VHD)	Person Hours of Travel (PHT)	Average Travel Time (min)	Average Speed (mph)	Length of Queues (mi)
		Alameda County	Dublin	Livermore	Pleasanton	CC County	State Routes	Total VMT	XX on Non-State Routes (regional traffic traveling on the local system)	Total	Total	Total	Total	Freeway and Route 84
Future Base Case	AM	70,883	64,835	119,533	97,791	2,785	366,928	722,755	38,632	10,101	29,666	49.2	27.2	6.43
	PM	84,650	76,828	136,593	106,150	4,067	337,818	746,106	54,056	13,687	34,884	33.1	23.6	4.46
	AM-PM Base Case total	155,533	141,664	256,126	203,942	6,852	704,746	1,468,861	92,688	23,788	64,550	41.1	25.4	10.88
Alt. 1 Add I-580 WB HOV lane to Isabel; widen Vallecitos.	AM	-60	402	-3,488	-3,919	1	-13,669	-20,732	-2,874	-74	-564	-7.98	-0.4	2.11
	PM	-681	-1,533	-2,642	-2,585	3	-3,606	-11,044	-3,294	-1,667	-2,352	-4.2	1.7	-1.21
	% Change (AM+PM / Base Case AM+PM)	-0.5%	-0.8%	-2.4%	-3.2%	0.1%	-2.5%	-2.2%	-6.7%	-8.2%	-4.5%	-14.8%	2.6%	8.3%
Alt. 4 Add I-580 EB truck climbing lane from truck scale to N. Flynn.	AM	-30	0	-90	-6	0	-27,169	-27,295	-25	-331	-1,173	-1.00	-1.4	0.43
	PM	487	-68	-1,807	-687	-7	-6,838	-8,920	-1,445	-353	-552	-1.9	1.6	0.04
	% Change (AM+PM / Base Case AM+PM)	0.3%	0.0%	-0.7%	-0.3%	-0.1%	-4.8%	-2.5%	-1.5%	-2.9%	-2.7%	-3.5%	0.4%	4.3%
Alt 6 Add I-680 NB HOV lane and "close the gap"; add mixed flow lane from Tassajara to Vasco.	AM	-1,211	-267	-1,523	-1,540	-2	-20,879	-25,423	-1,656	-685	-1,080	-2.9	-0.1	-1.03
	PM	-1,476	-1,399	-11,868	-2,183	-9	28,487	11,553	-8,379	-3,107	-2,795	-2.5	3.1	-0.66
	% Change (AM+PM / Base Case AM+PM)	-1.7%	-1.2%	-5.2%	-1.8%	-0.2%	1.1%	-0.9%	-10.8%	-15.9%	-6.0%	-6.5%	5.9%	-15.5%
Footnotes: 1) "-" negative means a reduction as compared to the future base case, and the number represents the unit of change. 2) "+" positive means an increase as compared to the future base case, and the number represents the unit of change. 3) Trip table is held constant for these runs, although the number of vehicles served in CORSIM varies by alternative. 4) Average travel time is defined by CORSIM between Andrade Rd. and N. Flynn Rd. for peak direction only; average of freeway and SR 84 routes														

Table 2. Summary of Regional Traffic (XX) Differences by Jurisdiction									
Alternative	Peak hour period	Regional Traffic - Vehicle Miles of Travel (XX VMT) by Jurisdiction							
		Alameda County	Dublin	Livermore	Pleasanton	CC County	State Routes	Total VMT	XX on Non-State Routes (regional traffic traveling on the local system)
Future Base Case	AM	15,445	6,716	8,080	7,254	1,136	267,587	306,219	38,632
	PM	19,889	8,366	17,775	6,398	1,628	299,111	353,167	54,056
	AM-PM Base Case total	35,335	15,083	25,855	13,652	2,764	566,698	659,386	92,688
Alt. 1 Add I-580 WB HOV lane to Isabel; widen Vallecitos.	AM	-192	261	-939	-2,007	5	1,876	-997	-2,874
	PM	-255	-1,296	-970	-775	1	2,723	-571	-3,294
	% Change (AM+PM / Base Case AM+PM)	-1.3%	-6.9%	-7.4%	-20.4%	0.2%	0.8%	-0.2%	-6.7%
Alt. 4 Add I-580 EB truck climbing lane from truck scale to N. Flynn.	AM	-6	0	-15	-4	0	28	3	-25
	PM	446	-186	-1,371	-330	-4	1,614	170	-1,445
	% Change (AM+PM / Base Case AM+PM)	1.2%	-1.2%	-5.4%	-2.4%	-0.2%	0.3%	0.0%	-1.6%
Alt 6 Add I-680 NB HOV lane and "close the gap"; add mixed flow lane from Tassajara to Vasco.	AM	-874	-63	-177	-538	-3	3,576	1,920	-1,656
	PM	-862	-541	-5,874	-1,105	3	15,016	6,637	-8,379
	% Change (AM+PM / Base Case AM+PM)	-4.9%	-4.0%	-23.4%	-12.0%	0.0%	3.3%	1.3%	-10.8%
Footnotes: 1) "-" negative means a reduction as compared to the future base case, and the number represents the unit of change. 2) "+" positive means an increase as compared to the future base case, and the number represents the unit of change. 3) Trip table is held constant for these runs, although the number of vehicles served in CORSIM varies by alternative.									

Memorandum

TO: Tri-Valley Triangle Study Technical Advisory Committee

FROM: Parsons

DATE: April 4, 2006

SUBJECT: Tri-Valley Triangle Study – Benefit – Cost Issues

Sample Benefit-Cost Calculation

The following tabulation gives estimated benefit-cost ratios for the alternatives analyzed so far. It is based on the 2030 measures of effectiveness, the high end of the capital cost estimates, and annualization of costs over 20 years. Essentially, one year of travel time savings (2030), valued at \$14.96 per hour,¹ is divided by one year of annualized costs. Because the time benefits are all of the same magnitude, the estimated project costs dominate the calculation. One could just as well rank the alternatives by cost.

Alternative	Time Savings (hrs)		Value of Time \$/hr	2030 Savings (M)	Capital Cost (M)		Approximate B/C Ratio
	Daily	Annual (M)			Total	Annualized	
1	4,160	4.9	\$14.96	\$72.8	\$150	\$14.2	5.1
4	2,957	3.5	\$14.96	\$51.8	\$50	\$4.7	11.0
6	4,655	5.4	\$14.96	\$81.5	\$490	\$46.3	1.8

Issues

This is a quick estimate. Usually, benefits are computed over 20 or 30 years. There is no existing estimate of delay from the combined travel demand model/CORSIM model to make that possible in this case.

Instead of the one-year approximation, a gradient of benefits from say, 2010 to 2030, could be assumed for the projects based on average traffic growth from existing conditions. However, that approach would be equally approximate as the one presented above. Input for the TAC is requested on which approach is desired.

One additional issue is that the highest cost is used. This is mostly because the benefits are for the final year (2030), which would be the highest benefit year, assuming ongoing traffic growth. However, a median cost could be used to see if it would give a different ranking. Again, any reaction from the TAC is invited.

¹ The value of time is from the MicroBENCOST (highway benefit-cost) model developed by the Texas Transportation Institute for the National Cooperative Highway Research Program in 1993, updated to 2006 by the Consumer Price Index.

Tri-Valley Triangle Traffic Study Report Outline

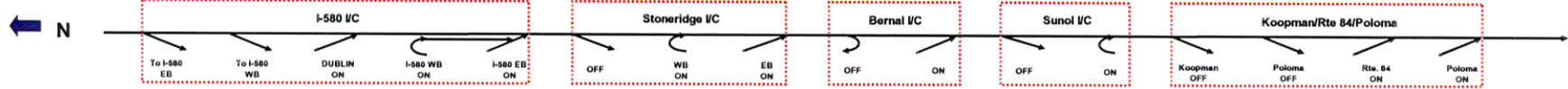
Executive Summary

- | | |
|-----------|--|
| Chapter 1 | Introduction
Report Overview and Report Organization
Triangle Study Overview
Future Base Condition
Alternatives for Evaluation
Hybrid Alternative |
| Chapter 2 | Existing Roadway Conditions |
| Chapter 3 | Travel Demand Forecast (including constrained forecasts) |
| Chapter 4 | 2030 Traffic Operations |
| Chapter 5 | Evaluation of Alternatives |
| Chapter 6 | Phasing and Implementation |
| Chapter 7 | Conclusions and Recommendations |

Technical Appendices

- Materials Referenced in Body of Report
- Results Summary – Charts and Tables
 - Overall Results
 - Dublin
 - Pleasanton
 - Livermore
 - Alameda County

I-680 SOUTHBOUND

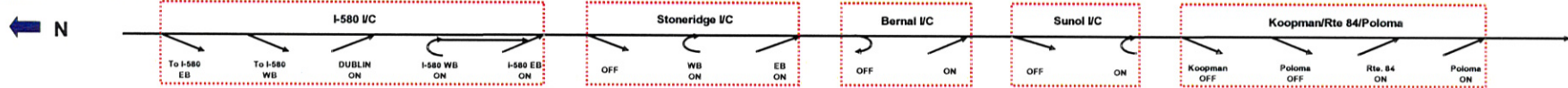


YEAR 2030 FUTURE BASELINE ANALYSIS

ML+NOV+AUX	4+0+2	4+0+1	3+0+0	3+0+0	3+0+0	3+0+1	3+0+0	3+0+0	3+0+0	3+0+0	3+0+0	3+0+0	3+0+0	3+0+0	3+0+0	3+0+0	3+0+0	3+0+0	3+0+0													
RAMP METER				NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO													
AM PEAK (Demand Vol.)	7,822	2,921	4,901	1,450	3,445	1,132	4,577		2,891	7,468	2,070	5,392	410	5,808	248	0,056	1,092	4,903	857	5,820	550	5,280	1,223	0,483	585	5,908	119	5,879	1,700	7,045	481	8,126
TOTAL SERVED VOLUMES	7,280	2,520	4,044	1,452	3,150	1,134	4,277		2,072	6,338	1,972	4,410	410	4,830	247	5,070	870	4,190	857	5,080	428	4,843	1,222	5,838	472	5,083	90	4,891	1,380	6,253	480	6,729
Avg. Speed. (MPH) - Mix-Flow	14	56	62		50				38	54	51	58	60	59		60	46	17	13													
BOTTLENECK																																
QUEUES & CONGESTION																																
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- LEGEND
- Bottleneck
 - Queue
 - Slow Moving Traffic
 - XXXX Mainline Volume
 - XXXX On-Ramp Volume
 - XXXX Off-Ramp Volume

I-680 SOUTHBOUND

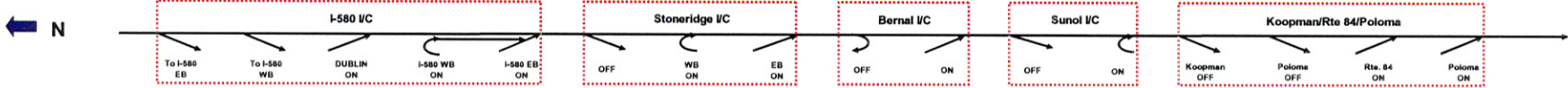


YEAR 2030 ALTERNATIVE #1 ANALYSIS

ML+NOV+AUX	4+0+2	4+0+1	3+0+0	3+0+0	3+0+0	3+0+0	3+0+0	3+0+0	3+0+0	3+0+0	3+0+0	3+0+0	3+0+0	3+0+0	3+0+0	3+0+0	3+0+0	3+0+0	3+0+0	3+0+0	3+0+0	3+0+0	3+0+0	3+0+0	3+0+0	3+0+0	3+0+0	3+0+0	3+0+0	3+0+0	3+0+0	
RAMP METER				NO		NO		NO		NO		NO		NO		NO		NO		NO		NO		NO		NO		NO		NO		NO
AM PEAK (Demand Vol.)	7,828	2,913	4,912	1,451	3,451	1,100	4,837	2,000	7,336	2,050	5,276	443	5,719	256	5,978	1,109	4,866	923	5,762	901	5,191	1,225	5,416	528	5,888	129	5,750	1,954	7,713	505	8,218	
TOTAL SERVED VOLUMES	7,826	2,845	4,965	1,425	3,558	1,100	4,744	1,939	6,537	1,893	4,741	443	5,155	256	5,416	801	4,453	922	5,297	877	4,521	1,225	5,469	479	4,874	85	4,806	1,811	6,863	505	7,168	
Avg. Speed. (MPH) - Mix-Flow	15	59	61	31				25	45	46	58	90	42	16	16	12	11	16	58													
BOTTLENECK																																
QUEUES & CONGESTION																																
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Lane-2																																
Lane-3																																
Lane-4																																
Auxiliary Lane-1																																
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Auxiliary Lane-3																																

LEGEND
Bottleneck
Queue
Slow Moving Traffic
XXXX Mainline Volume
XXXX On-Ramp Volume
XXXX Off-Ramp Volume

I-680 SOUTHBOUND



YEAR 2030 ALTERNATIVE #4 ANALYSIS

ML+RDV+AUX	4+0+2	4+0+7	3+0+0	3+0+0		3+0+1	3+0+0	3+0+0	3+0+0	3+0+0	3+0+0	3+0+0	3+0+0	3+0+0	3+0+0	3+0+0	3+0+0	3+0+0	3+0+0	3+0+0
RAMP METER				NO	NO	NO		NO	NO		NO		NO		NO		NO		NO	NO
AM PEAK (Demand Vol.)	7,822	2,921	4,961	1,455	3,445	1,132	4,577	2,891	7,468	2,070	5,392	410	5,808	248	6,056	1,092	4,963	857	5,826	500
TOTAL SERVED VOLUMES	7,200	2,478	4,849	1,482	3,183	1,132	4,344	2,012	6,301	1,942	4,448	410	4,860	248	5,080	914	4,105	858	5,026	512
Avg. Speed. (MPH) - Mix-Flow	13	53	82	50				35	92	92	52	57	60	59	60	47	17	12	18	55
BOTTLENECK																				
QUEUES & CONGESTION																				
Lane-1																				
Lane-2																				
Lane-3																				
Lane-4																				
Auxiliary Lane-1																				
Auxiliary Lane-2																				
Auxiliary Lane-3																				

LEGEND

Bottleneck

Queue

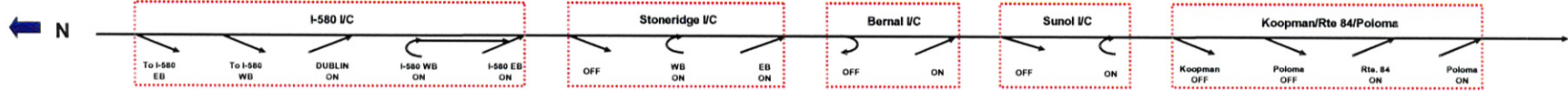
Slow Moving Traffic

XXXX Mainline Volume

XXXX On-Ramp Volume

XXXX Off-Ramp Volume

I-680 SOUTHBOUND

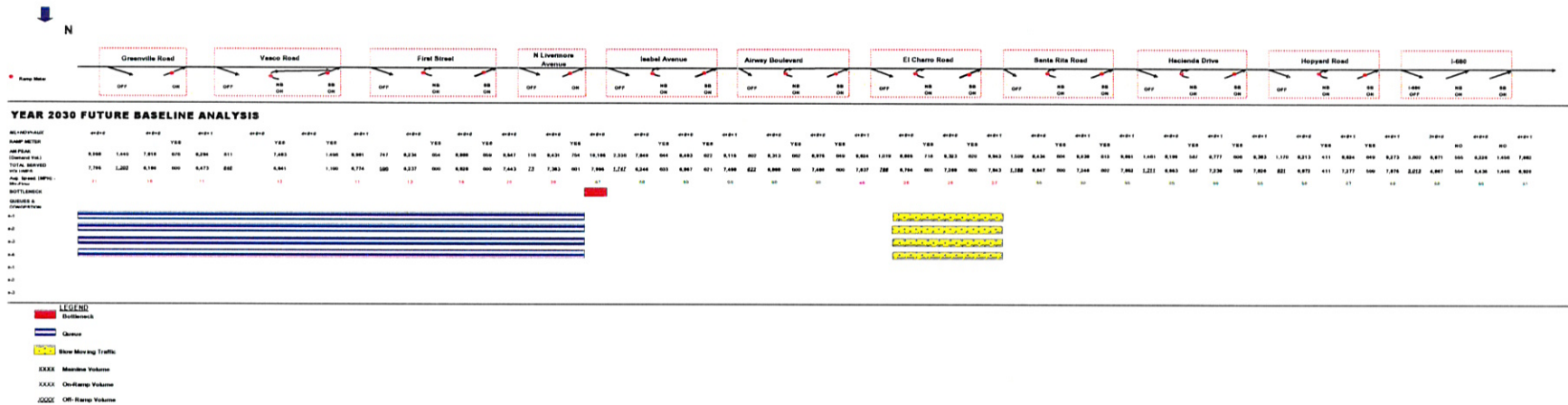


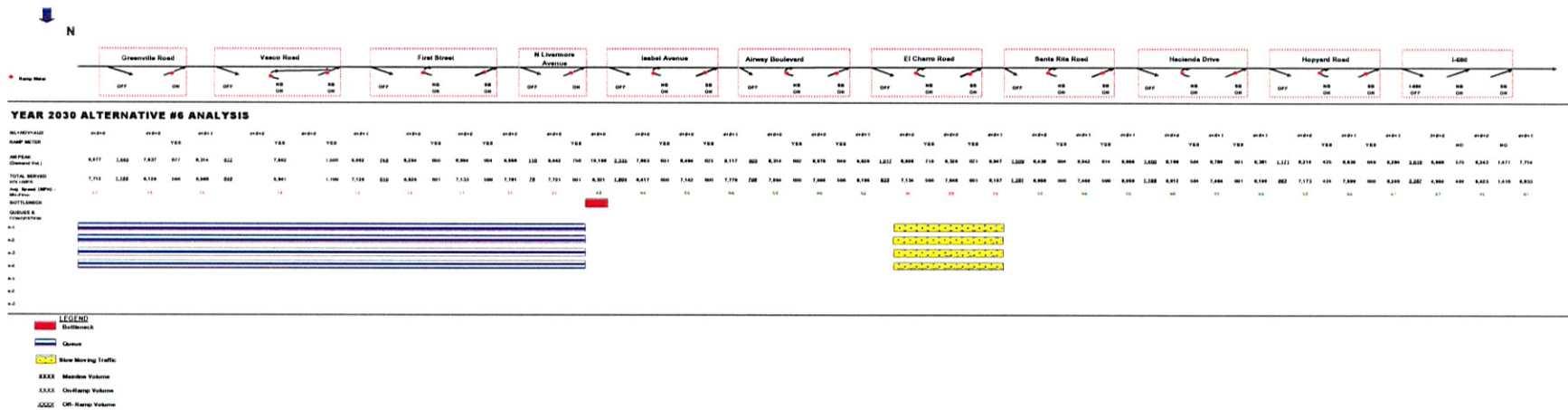
YEAR 2030 ALTERNATIVE #6 ANALYSIS

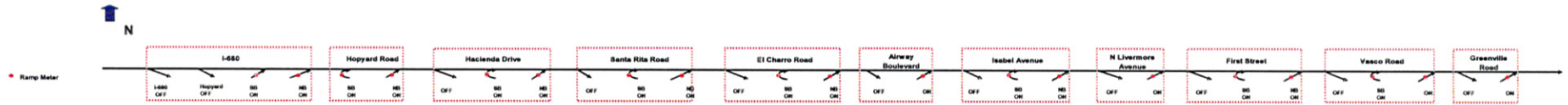
ML+NOV+AUX	4+0+2	4+0+1	3+0+0	3+0+0	3+0+0	3+0+1	3+0+0	3+0+0	3+0+0	3+0+0	3+0+0	3+0+0	3+0+0	3+0+0	3+0+0	3+0+0	3+0+0	3+0+0	3+0+0
RAMP METER			NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
AM PEAK (Demand Vol.)	7,787	2,920	4,881	1,471	3,390	1,158	4,548	2,898	7,448	2,082	5,384	410	5,780	250	8,030	1,088	4,841	801	5,802
TOTAL SERVED VOLUMES	7,238	2,588	4,821	1,424	3,198	1,158	4,387	2,008	6,422	1,848	4,528	410	4,937	250	5,187	818	4,241	801	5,085
Avg. Speed: (MPH) - Mix-Flow	13	54	82	47					38	58	48		58		80		58		58
BOTTLENECK																			
QUEUES & CONGESTION																			
Lane-1																			
Lane-2																			
Lane-3																			
Lane-4																			
try Lane-1																			
try Lane-2																			
try Lane-3																			

LEGEND

- Bottleneck
- Queue
- Slow Moving Traffic
- XXXX Mainline Volume
- XXXX On-Ramp Volume
- XXXX Off-Ramp Volume





**YEAR 2030 FUTURE BASELINE ALTERNATIVE**

WATERVAGE	#001	#002	#003	#004	#005	#006	#007	#008	#009	#010	#011	#012	#013	#014	#015	#016	#017	#018	#019	#020	#021	#022	#023	#024	#025	#026	#027	#028	#029	#030	#031	#032	#033	#034	#035	#036	#037	#038	#039	#040	#041	#042	#043	#044	#045	#046	#047	#048	#049	#050	#051	#052	#053	#054	#055	#056	#057	#058	#059	#060	#061	#062	#063	#064	#065	#066	#067	#068	#069	#070	#071	#072	#073	#074	#075	#076	#077	#078	#079	#080	#081	#082	#083	#084	#085	#086	#087	#088	#089	#090	#091	#092	#093	#094	#095	#096	#097	#098	#099	#100	#101	#102	#103	#104	#105	#106	#107	#108	#109	#110	#111	#112	#113	#114	#115	#116	#117	#118	#119	#120	#121	#122	#123	#124	#125	#126	#127	#128	#129	#130	#131	#132	#133	#134	#135	#136	#137	#138	#139	#140	#141	#142	#143	#144	#145	#146	#147	#148	#149	#150	#151	#152	#153	#154	#155	#156	#157	#158	#159	#160	#161	#162	#163	#164	#165	#166	#167	#168	#169	#170	#171	#172	#173	#174	#175	#176	#177	#178	#179	#180	#181	#182	#183	#184	#185	#186	#187	#188	#189	#190	#191	#192	#193	#194	#195	#196	#197	#198	#199	#200	#201	#202	#203	#204	#205	#206	#207	#208	#209	#210	#211	#212	#213	#214	#215	#216	#217	#218	#219	#220	#221	#222	#223	#224	#225	#226	#227	#228	#229	#230	#231	#232	#233	#234	#235	#236	#237	#238	#239	#240	#241	#242	#243	#244	#245	#246	#247	#248	#249	#250	#251	#252	#253	#254	#255	#256	#257	#258	#259	#260	#261	#262	#263	#264	#265	#266	#267	#268	#269	#270	#271	#272	#273	#274	#275	#276	#277	#278	#279	#280	#281	#282	#283	#284	#285	#286	#287	#288	#289	#290	#291	#292	#293	#294	#295	#296	#297	#298	#299	#300	#301	#302	#303	#304	#305	#306	#307	#308	#309	#310	#311	#312	#313	#314	#315	#316	#317	#318	#319	#320	#321	#322	#323	#324	#325	#326	#327	#328	#329	#330	#331	#332	#333	#334	#335	#336	#337	#338	#339	#340	#341	#342	#343	#344	#345	#346	#347	#348	#349	#350	#351	#352	#353	#354	#355	#356	#357	#358	#359	#360	#361	#362	#363	#364	#365	#366	#367	#368	#369	#370	#371	#372	#373	#374	#375	#376	#377	#378	#379	#380	#381	#382	#383	#384	#385	#386	#387	#388	#389	#390	#391	#392	#393	#394	#395	#396	#397	#398	#399	#400	#401	#402	#403	#404	#405	#406	#407	#408	#409	#410	#411	#412	#413	#414	#415	#416	#417	#418	#419	#420	#421	#422	#423	#424	#425	#426	#427	#428	#429	#430	#431	#432	#433	#434	#435	#436	#437	#438	#439	#440	#441	#442	#443	#444	#445	#446	#447	#448	#449	#450	#451	#452	#453	#454	#455	#456	#457	#458	#459	#460	#461	#462	#463	#464	#465	#466	#467	#468	#469	#470	#471	#472	#473	#474	#475	#476	#477	#478	#479	#480	#481	#482	#483	#484	#485	#486	#487	#488	#489	#490	#491	#492	#493	#494	#495	#496	#497	#498	#499	#500	#501	#502	#503	#504	#505	#506	#507	#508	#509	#510	#511	#512	#513	#514	#515	#516	#517	#518	#519	#520	#521	#522	#523	#524	#525	#526	#527	#528	#529	#530	#531	#532	#533	#534	#535	#536	#537	#538	#539	#540	#541	#542	#543	#544	#545	#546	#547	#548	#549	#550	#551	#552	#553	#554	#555	#556	#557	#558	#559	#560	#561	#562	#563	#564	#565	#566	#567	#568	#569	#570	#571	#572	#573	#574	#575	#576	#577	#578	#579	#580	#581	#582	#583	#584	#585	#586	#587	#588	#589	#590	#591	#592	#593	#594	#595	#596	#597	#598	#599	#600	#601	#602	#603	#604	#605	#606	#607	#608	#609	#610	#611	#612	#613	#614	#615	#616	#617	#618	#619	#620	#621	#622	#623	#624	#625	#626	#627	#628	#629	#630	#631	#632	#633	#634	#635	#636	#637	#638	#639	#640	#641	#642	#643	#644	#645	#646	#647	#648	#649	#650	#651	#652	#653	#654	#655	#656	#657	#658	#659	#660	#661	#662	#663	#664	#665	#666	#667	#668	#669	#670	#671	#672	#673	#674	#675	#676	#677	#678	#679	#680	#681	#682	#683	#684	#685	#686	#687	#688	#689	#690	#691	#692	#693	#694	#695	#696	#697	#698	#699	#700	#701	#702	#703	#704	#705	#706	#707	#708	#709	#710	#711	#712	#713	#714	#715	#716	#717	#718	#719	#720	#721	#722	#723	#724	#725	#726	#727	#728	#729	#730	#731	#732	#733	#734	#735	#736	#737	#738	#739	#740	#741	#742	#743	#744	#745	#746	#747	#748	#749	#750	#751	#752	#753	#754	#755	#756	#757	#758	#759	#760	#761	#762	#763	#764	#765	#766	#767	#768	#769	#770	#771	#772	#773	#774	#775	#776	#777	#778	#779	#780	#781	#782	#783	#784	#785	#786	#787	#788	#789	#790	#791	#792	#793	#794	#795	#796	#797	#798	#799	#800	#801	#802	#803	#804	#805	#806	#807	#808	#809	#810	#811	#812	#813	#814	#815	#816	#817	#818	#819	#820	#821	#822	#823	#824	#825	#826	#827	#828	#829	#830	#831	#832	#833	#834	#835	#836	#837	#838	#839	#840	#841	#842	#843	#844	#845	#846	#847	#848	#849	#850	#851	#852	#853	#854	#855	#856	#857	#858	#859	#860	#861	#862	#863	#864	#865	#866	#867	#868	#869	#870	#871	#872	#873	#874	#875	#876	#877	#878	#879	#880	#881	#882	#883	#884	#885	#886	#887	#888	#889	#890	#891	#892	#893	#894	#895	#896	#897	#898	#899	#900	#901	#902	#903	#904	#905	#906	#907	#908	#909	#910	#911	#912	#913	#914	#915	#916	#917	#918	#919	#920	#921	#922	#923	#924	#925	#926	#927	#928	#929	#930	#931	#932	#933	#934	#935	#936	#937	#938	#939	#940	#941	#942	#943	#944	#945	#946	#947	#948	#949	#950	#951	#952	#953	#954	#955	#956	#957	#958	#959	#960	#961	#962	#963	#964	#965	#966	#967	#968	#969	#970	#971	#972	#973	#974	#975	#976	#977	#978	#979	#980	#981	#982	#983	#984	#985	#986	#987	#988	#989	#990	#991	#992	#993	#994	#995	#996	#997	#998	#999	#1000
RAMP TOTAL																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									</																																																																																																																																																																																																																																																																																																																																																																																																															

QUEUES & CONGESTION

HOV Lane

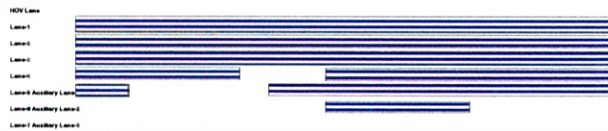
Figure 1: Schematic representation of the experimental design. The diagram illustrates the sequence of events for three groups: Lateral (L), Lateral/Accessory (LA), and Lateral/Accessory/Accessory (LAA). Each group has a 'Lateral' phase (blue bar) and an 'Accessory' phase (green bar). The Lateral phase is followed by the Accessory phase. The Lateral/Accessory group has a shorter Lateral phase and a longer Accessory phase. The Lateral/Accessory/Accessory group has the shortest Lateral phase and the longest Accessory phase. The diagram is divided into three sections: Lateral, Accessory, and Lateral/Accessory. The Lateral section shows the Lateral phase for all groups. The Accessory section shows the Accessory phase for all groups. The Lateral/Accessory section shows the Lateral phase for the Lateral/Accessory group and the Accessory phase for the Lateral/Accessory/Accessory group.

LEGEND

- | | |
|---|------------------------|
|  | Bottleneck |
|  | Queue |
| XXXX | Mainline Volume |
| XXXX | On-Ramp Volume |
| XXXX | Off-Ramp Volume |

[illegible]

QUEUES & CONGESTION



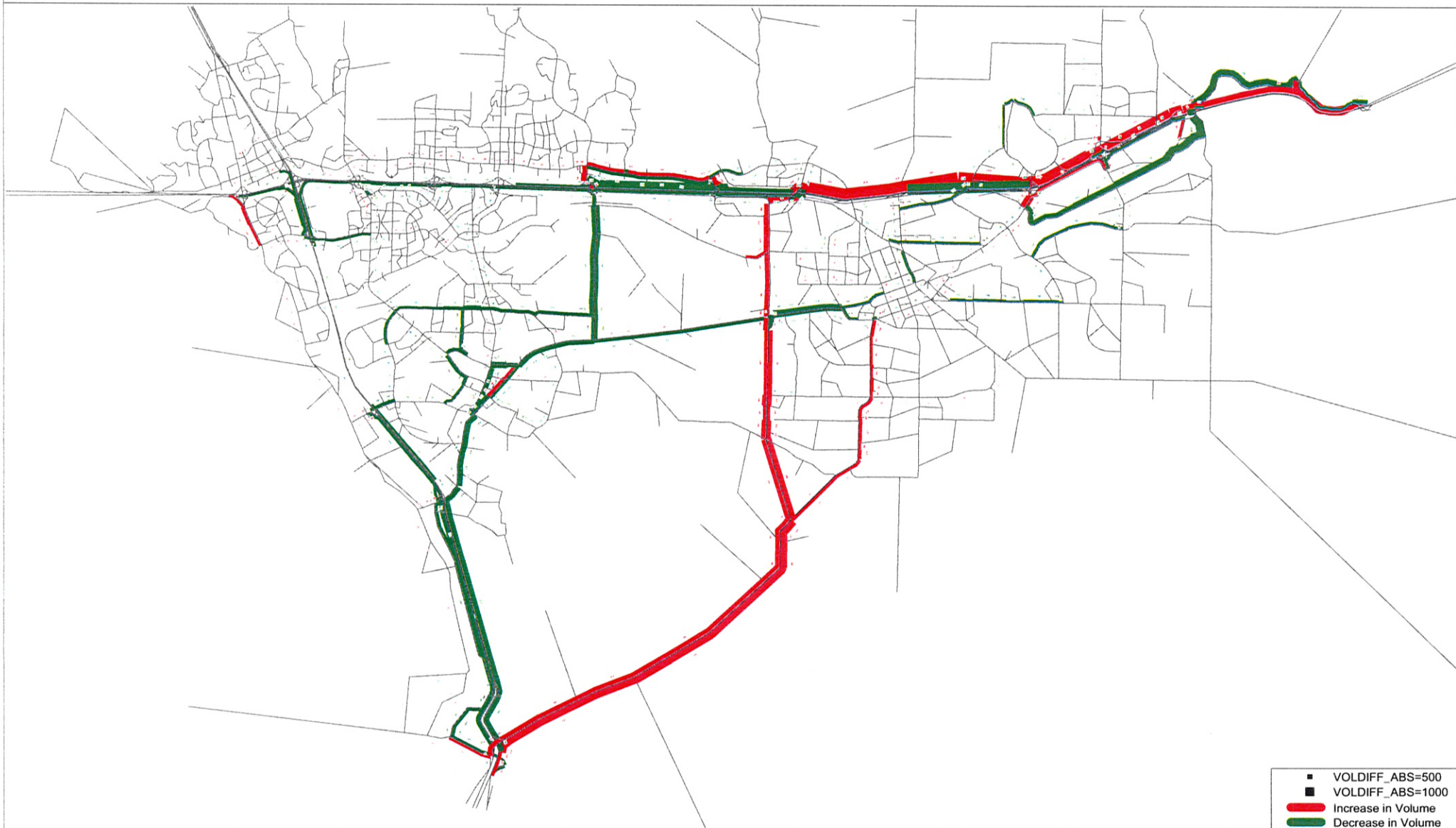
LEGEND

- | | |
|---|------------------------|
|  | Bottleneck |
|  | Queue |
| XXXX | Mainline Volume |
| XXXX | On-Ramp Volume |
| XXXX | Off-Ramp Volume |



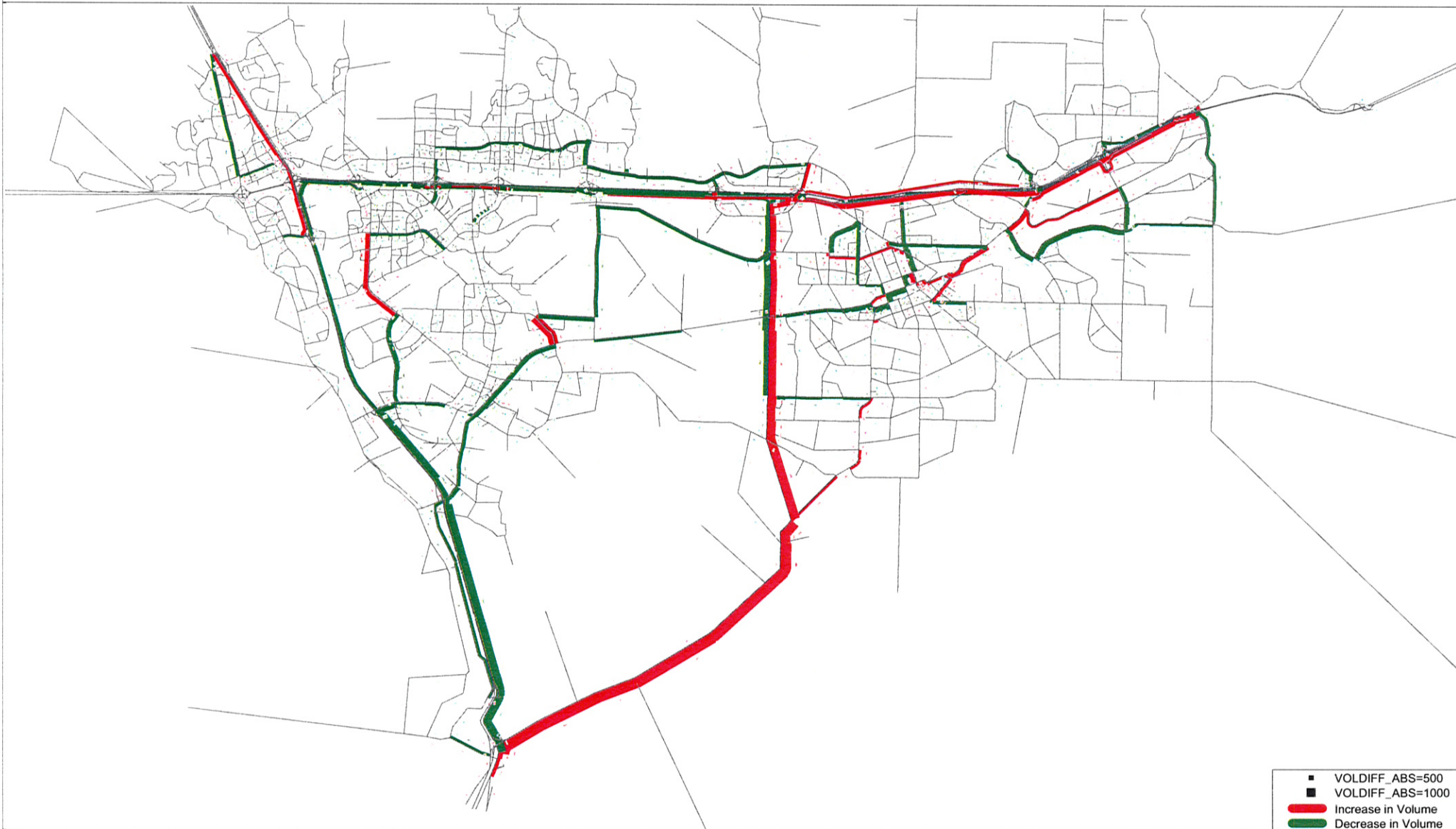


ACCMA Triangle Study
Alt. 1 vs. Future Base
AM Peak Hour



- VOLDIFF_ABS=500
- VOLDIFF_ABS=1000
- Increase in Volume
- Decrease in Volume

ACCMA Triangle Study
Alt. 1 vs. Future Base
PM Peak Hour



**ACCMA Triangle Study
Alt. 4 vs. Future Base
AM Peak Hour**

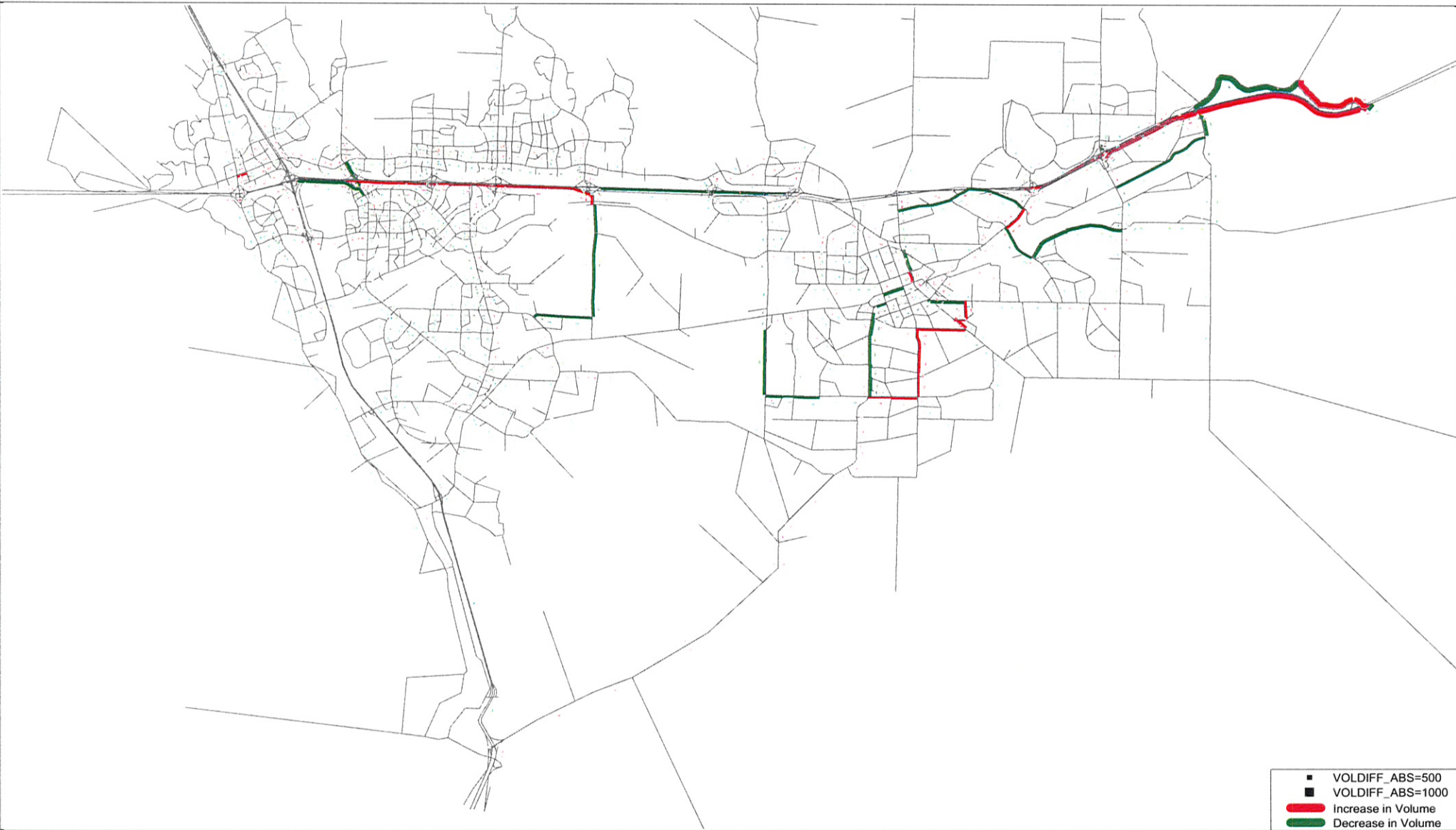


- VOLDIFF_ABS=500
- VOLDIFF_ABS=1000
- Increase in Volume
- Decrease in Volume

c:\Kym\Projects\2005\IP05016_ACCMA_Triangle\Runs\PostCORSIMALT4_AM1HR_DIFF.NET (3/31/2006)

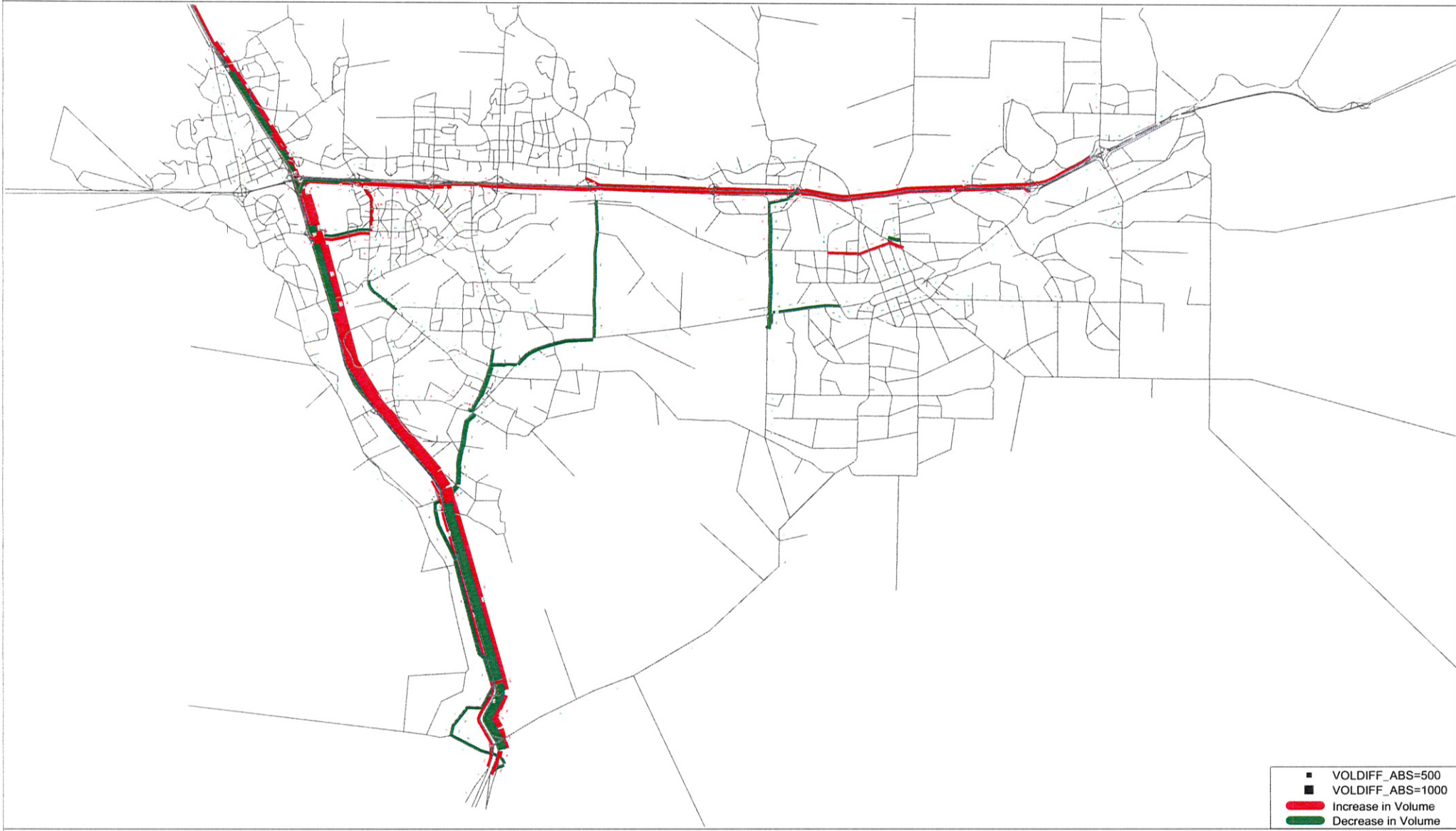
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ACCMA Triangle Study
Alt 4 vs. Future Base
PM Peak Hour

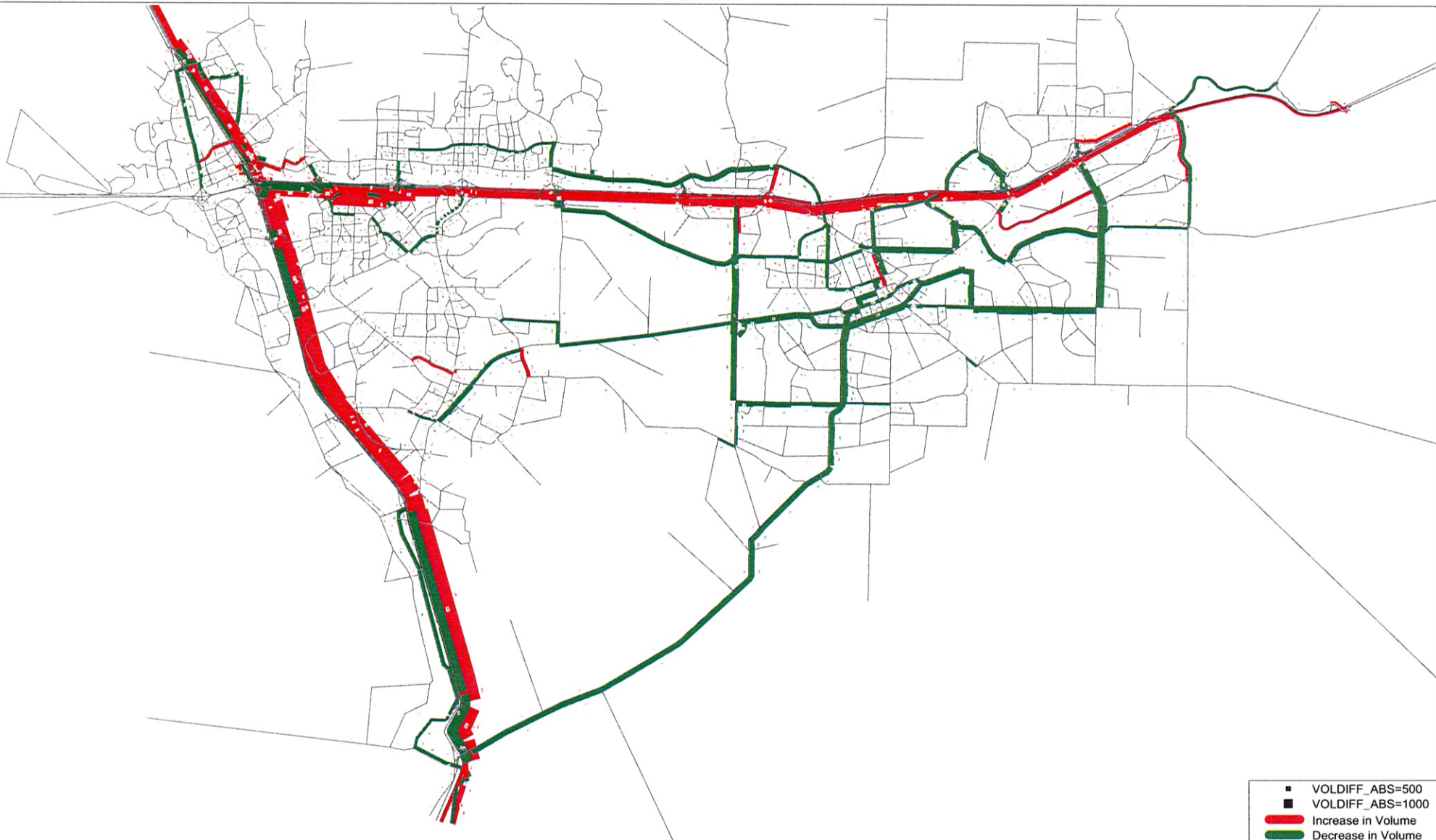


- VOLDIFF_ABS=500
- VOLDIFF_ABS=1000
- Increase in Volume
- Decrease in Volume

ACCMA Triangle Study
Alt. 6 vs. Future Base
AM Peak Hour



ACCMA Triangle Study
Alt. 6 vs. Future Base
PM Peak Hour



- VOLDIFF_ABS=500
- VOLDIFF_ABS=1000
- Increase in Volume
- Decrease in Volume